Fermi National Accelerator Laboratory

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Engineering Note

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Project: D0 Tracking Electronics
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Subject: Suggested initial checkout for a 1553 interface design

Introduction

This note contains suggested tests an in-house 1553 interface design must pass before the circuit is released for production. These tests are considered preliminary with respect to the more rigorous testing that Control System diagnostic software can perform. It is assumed that the reader of this note has a good understanding of the requirements of the 1553 specification. Please be forewarned that some aspects of the 1553 specification are not supported by the neither Fermilab 1553 Controllers nor some of the software. It is understood that many of the more esoteric features of the 1553 spec are unnecessary for our purposes of reading and writing data to our remote electronics. These preliminary tests are easily performed using the familiar D0 spreadsheet system as it performs read and write cycles and checks the status woid. Any suitable custom software, however, may be used.

Suggested Tests:

- The module should be tested for response to all RT addresses for all possible dipswitch or geographic address settings.
- It should respond only to the RT address selected.
- If the module is designed to respond to the broadcast command, it should record the data and appropriately suppress the status word as described in the specification.
- Proper response to all assigned subaddresses should be verified.
- If a transaction to an unused subaddress is requested, the module should not respond.
- The module should respond properly to word counts from 1 to 32 if appropriate.
- If a module is capable of transmitting or receiving n words, it should also transmit or receive any word count from 1 to n without error.
- Mode codes are generally not used, but functionality should be tested if mode codes are designed into the module.

- Test for shorted data bits by transmitting and receiving the bit patterns 5555 and AAAA.
- Probe both legs of the 1553 bus (the connection to the twisted pair) and look for a minimum amplitude of 3.5 Volts for Direct Coupling and no zero-point crossover distortion of the manchester signal, especially evident in the "word sync". Rounded pulses should be remedied, and rise times should be between 100ns and 300ns.
- It is suggested that a test of operation is performed when there are several other RTs attached to the bus, since this loading tends to diminish signal amplitudes. The sixth floor has many rack monitors available for this purpose.